CALIFORNIA WATER PLAN NEWS

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Contents Highlights

California Water Plan News is a publication of the Department of Water Resources' statewide planning program. One of the program's major activities is updating the California Water Plan (Bulletin 160) every five years. As part of this work, DWR staff collect and analyze data on land and water use, and forecast future conditions affecting statewide water supplies and demands. This newsletter describes data and forecasting techniques associated with statewide water supply planning. It also provides an overview of conditions or developments influencing planning at the state level. We welcome your questions and comments on material presented here.

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Water Use Implications of Land Use Planning

Land use planning—urbanization of agricultural lands—open space preservation—what do these items have in common? All have water use implications.

The Department of Finance forecasts that California's population will increase by more than 15 million people by 2020. Where those people will live affects statewide urban water use. In terms of percent population increase, DOF forecasts that the City and County of San Francisco will have one of the slowest growth rates statewide. Immediately adjoining Bay Area counties are also forecast to grow slowly. (These slow growth rates reflect the region's intensive existing urbanization and relatively small amounts of remaining undeveloped land.) Areas expected to experience high growth rates include some San Joaquin Valley counties and the Inland Empire region in Southern California. This pattern is significant in terms of future urban water use. Although, for example, urban per capita water use has decreased in some coastal areas as conservation measures are implemented, there has been an overall increase in per capita use statewide. The increase results from population shifts to warmer, drier inland areas where urban outdoor water use is higher.

The location of urban development significantly impacts agricultural water use. For example, new subdivisions constructed on nonirrigated grazing lands do not directly displace agricultural use (although they may compete with existing water users for a supply). Subdivisions constructed on irrigated farmland result in direct conversion of water use from agricultural to urban. Bulletin 160-98 forecasts a statewide decline in irrigated acreage of 300,000 acres by 2020. Most of that decline is

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Alfalfa and Market Conditions

David Scruggs is a Senior Land and Water Use Analyst with the Department's San Joaquin District.

Forecasting agricultural water use entails estimating future irrigated acreage and the associated crop mix. Several major crop groups—cotton, alfalfa, truck crops, grains, and irrigated pasture—constitute much of California's irrigated acreage. This article reviews factors affecting the market for one of these crop groups. Market conditions are a key element in influencing planted acreage.

The market for California alfalfa is closely tied to the State's dairy industry. California is the nation's leading dairy state. According to the California Department of Food and Agriculture's 1996 statistics, milk/cream production amounted to $3.7 billion, making it the State's top-valued agricultural commodity. California, with about 1.3 million dairy cows and more than 2,300 dairy farms, accounted for almost 17 percent of the nation's dairy production in 1996. Leading dairy counties are Tulare, San Bernardino, Merced, Stanislaus, and Riverside.

Alfalfa supports the dairy and livestock industries (including the recreational horse industry) and also provides about one-third of the nation's honey production. California is currently the number one dairy state in the U.S. due, in large part, to a ready supply of high-quality, highly digestible, and high-protein alfalfa. Nevertheless, State alfalfa production does not meet the demand within the State. Alfalfa is trucked from the intermountain states (mostly Nevada) to Central California dairies. (Some Nevada production sites are actually closer to the Central Valley than are Northern or Southern California sites.) In addition, California exports alfalfa to Japan, but imports have exceeded exports over the past several years by 1 to 8 percent.

California milk/cream production has increased more than 50 percent in the past 12 years. About half of this increase is due to increases in milk yield per cow, with the remainder due to increased numbers of cows. This has created a tremendous and continuing demand for high-quality alfalfa in the State. The high prices growers have enjoyed of late ($155-$160/ton in the Valley) likely reflect a long-term imbalance in California between supply and demand for forages. Industry experts project plantings will be up 5 to 15 percent statewide in 1998. Additionally, shortages of alfalfa seed have been reported recently.

Compared with other forages—including winter cereal silage, corn silage, grass hays, and cereal hays—the production performance achieved by cows fed alfalfa is difficult to surpass. Alfalfa's forage quality and possible reasons for its superiority as a forage for lactating dairy cows include: (1) nutrient composition of high-crude protein and calcium, (2) rate of fiber digestion that supports high-dry matter intake, and (3) ruminal buffering characteristics. It is very difficult to replace alfalfa in the rations of a high-producing dairy cow, and most dairy rations in California contain some component of alfalfa.

Relatively little raw milk flows into or out of the State. California's dairy industry is based on in-state production and processing capacity. The demand for milk products is greatest in the State's major population centers— the San Francisco Bay Area and urbanized

How California's Raw Milk Production is Used

According to the Department of Food and Agriculture, California's Grade A milk production can be broken down into the following categories:

Cheese	**36%**
Butter and nonfat dry milk	**29%**
Fluid milk products	**24%**
Frozen dairy products	**6%**
Soft products	**5%**

Southern California. Dairy production has been concentrated in the San Joaquin Valley and in the Inland Empire region of Southern California, within convenient haulage distances of the major markets. Increasing urbanization of former agricultural lands in Southern California is shifting more dairy production to the southern San Joaquin Valley.

To supply feed to these dairies, the San Joaquin Valley has become the largest production area for alfalfa in the State. Valley counties produce nearly half of California's alfalfa. Average yields per acre in the San Joaquin Valley exceed those in other production areas. In the southern part of the Valley, alfalfa is often rotated with cotton, while in the northern Valley it is often rotated with grains and corn. Producing alfalfa fields receive seven to eight cuttings each year. Alfalfa is a perennial crop, grown for three to five years. During this period, the green foliage is allowed to grow to a predetermined stage at which time the entire top portion is cut (harvested) and is either fed fresh (greenchop) or is allowed to dry for later baling. The stubble (alfalfa crowns, 3-4 inches tall) is then left to regrow for subsequent cutting.

Since 1958, the Department has been conducting land use surveys in the San Joaquin Valley to determine the amount of irrigated acreage. Periodic surveys for Tulare and Stanislaus Counties illustrate historic trends in alfalfa acreage in the northern and southern parts of the Valley. Alfalfa acreage has been gradually declining statewide and in San Joaquin Valley counties since the beginning of the Department's survey program. Statewide acreage in 1958 was 1.3 million acres, according to county agricultural commissioner reports. The Department's 1958 survey showed 98,000 acres in Tulare County and 60,820 acres in Stanislaus County. Statewide acreage in 1995 declined to 1.05 million, while the Department's surveys showed Tulare County with 76,690 acres in 1993 and Stanislaus County with 34,560 acres in 1996. Yields per acre during this period increased, however, from 5.0 to 6.9 tons/acre statewide, from 7.0 to 8.1 tons/acre in Tulare County, and from 6.5 to 7.5 tons/acre in Stanislaus County.

Average consumers do not recognize alfalfa as a valuable product as

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Recent SWRCB Action on Carmel River

Statewide Planning Branch staff compiled this article from information in SWRCB's files.

SWRCB recently completed a water rights action on the Carmel River that involved groundwater extraction along the riverbed. Because of the wide interest in the general subject of surface water and groundwater interaction, we have summarized SWRCB's Carmel River actions for this newsletter issue.

The Carmel River basin is a small watershed about 254 square miles in extent. The river originates in coastal mountains, flows through Carmel Valley, and enters the Pacific Ocean on the south side of the City of Carmel. The California-American Water Company (Cal-Am) diverts water from the Carmel River and supplies much of the water to users on the Monterey Peninsula outside of the watershed. Cal-Am owns the 3,100 acre-foot Los Padres Dam and Reservoir on the Carmel River.

Between 1987 and 1991, four complaints were filed with the SWRCB against Cal-Am's diversion of water from the Carmel River. The complaints generally alleged that Cal-Am did not have a legal right to divert water and that its diversions were adversely affecting the

A satellite view of the lower Carmel River. North is at the top of the photo, where Monterey Bay can be seen. The Carmel River flows through the small valley on the south side of the ridge separating the Carmel and Salinas River drainage basins. The sandy beaches of Carmel Bay are visible at the left edge of the photo.

River's public trust resources. SWRCB conducted a hearing on the 1992-1994 complaints and issued Order WR 95-10 in 1995.

Order WR 95-10 found that the subsurface flow of the Carmel River between river mile 17.2 and the river's junction with the ocean was a subterranean stream subject to SWRCB's water right permitting authority. The order found that Cal-Am had a legal right to 3,376 acre-feet per annum of the approximately 14,106 acre-feet that it was diverting from the river at the time, and that Cal-Am's diversions were having an adverse impact on the river's public trust resources.

The order directed Cal-Am to proceed according to a schedule to obtain rights to cover its existing diversion and use of water (i.e., the approximately 10,700 acre-feet not covered in existing rights) and to implement measures to minimize harm to public trust resources (including reducing its extractions). One option for Cal-Am to obtain water rights would be to construct the New Los Padres Reservoir.

Monterey Peninsula Water Management District had completed an environmental impact report that recommended a 24,000-acre-foot New Los Padres Reservoir on the Carmel River for supplying the Peninsula's expected urban growth, and had put a proposed bond measure to fund the dam before area voters in a 1995 election. Voters rejected the bond measure. SWRCB had issued a water rights permit in 1995 to MPWMD for New Los Padres Reservoir, with conditions that would preserve the Carmel River's steelhead and riparian habitat and protect the water rights of existing in-basin diverters.

SWRCB's action on Order WR 95-10 and the New Los Padres permit (SWRCB Decision 1632) was challenged in litigation. The three court cases were settled in 1998, and SWRCB adopted Order WR 98-04 in response to the settlement. Order WR 98-04 reaffirmed the finding of Order WR 95-10 that the river's subsurface flow in the specified reach was a subterranean stream subject to SWRCB permitting authority. Cal-Am is currently studying a smaller New Los Padres project, sized only to cover its existing water uses.

Earthquake Engineering Data

David Kessler is a senior seismologist with the Division of Operations and Maintenance.

The Department operates and maintains a State Water Project strong motion program to collect seismic acceleration data at locations important to Project operations. Data recorded during moderate to large earthquakes provide valuable information on structures' responses to earthquakes—information that can be used by the Department and by other water agencies in operating and designing facilities. Due to the few instrumented water facilities and the (fortunately) infrequent occurrence of large earthquakes, recorded data on facility performance in such events are relatively sparse. This article is provided to make readers aware of the sites where data may be available. Water agencies performing studies on their water supply reliability or on maintaining service at lifeline facilities after a seismic event would typically compile data from nearby instrumented sites as part of their studies.

The Department has installed accelerometers on dams, power and pumping plants, and on Sacramento-San Joaquin River Delta levees, and has 37 separate locations containing 95 recorders. Of those, 56 are analog film recorders. The others are newer digital recorders. The analog recorders are being replaced with digital recorders so that data can be transmitted directly to Sacramento shortly after being recorded.

The analog data consist of film records produced by mechanical-optical instruments that amplify motion through a system of lenses and prisms, using a small light source to record the data on photographic film. There are generally three orthogonal components of motion recorded along with a fixed trace to aid in the amplitude measurements. (The accelerometer is the sensor, the accelerograph is the recording media along with the sensor, and the accelerogram is the record written by the accelerograph.)

Information obtained from the accelerogram by visual inspection and simple scaling consists of: (1) peak acceleration, (2) duration of strong shaking, (3) frequency of the predominant waves along with a rough idea of the frequency range, (4) amplitude and frequency relationships between the vertical and horizontal components, and (5) approximate distance between the recording site and the earthquake epicenter. Such information can be produced quickly from these records once the film is developed. If more information is desired, further processing requires digitization.

In contrast, digital recorders rapidly provide the above information along with digitized data suitable for advanced analyses—the data can be accessed as soon as someone queries the station. Information such as the velocity and displacement experienced by the structure can be obtained by integration of the acceleration time history. The response spectra can then be computed, showing acceleration, velocity, or displacement as a function of frequency, thus indicating what frequencies the structure was responding to.

A strong motion station or site contains at least one accelerograph but can be as sophisticated as the Department's instrumentation at Oroville Dam (with eight accelerographs in the dam) or in the Delta. The Delta installation has four sites—at levees on Staten, Sherman, and Clifton Court Islands, and at the eastern edge of Suisun Marsh. Three borehole packages are at each station, each containing three accelerometers, all orthogonol to each other—a vertical and two horizontals. The longitudinal direction is pointing to the geographic north. The three boreholes at each site vary from about 10 feet to more than 500 feet in depth, and there is also a three-component accelerometer on the surface. Two of the sites have freefield accelerographs. At each site, a buried vault contains two 6-channel recorders to record the motion of the 12 sensors in and on the levee. Each of the four stations can be reached by telephone, fiber optic, spread-spectrum radio, or a combination of these methods.

Strong motion data are used by engineers to analyze performance of dams and other structures such as power and pumping plants, to validate design models and studies, to provide planning data for new facilities, to provide historical baseline data, and to provide information for structure performance reports. Acceleration data are used to evaluate the dynamic properties of a dam and its materials and determine if the seismic factors used in the design of the dam are adequate. Dynamic soil properties such as shear moduli and damping factors can be calculated from structures' measured response to earthquakes.

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East Bay Municipal Utility District's Mokelumne Aqueduct crossing the Sacramento-San Joaquin River Delta. Seismic acceleration data are used in the design of water storage and conveyance facilities. The Department's Delta accelerographs were installed after the Loma Prieta event; thus, there were no data on response of Delta levees to that event.

California Drinking Water Source Assessment and Protection Program

Carl Hauge is a Supervising Engineering Geologist with the Statewide Planning Branch.

In 1996, the federal Safe Drinking Water Act was amended to require each state to establish a program to assess the potential for contamination of every public drinking water source. The assessment must include: (1) a delineation of the area surrounding the water source from which contaminants could reach the source; (2) an inventory of all historical, existing, and potential activities that might release contaminants within that delineated area; and (3) an analysis of the relative vulnerability of the drinking water source to contamination by those potential contaminants. The U.S. Environmental Protection Agency has encouraged states to take the next step and include protection of the source water in their program. California is including source water protection as a part of the program.

In California, the Department of Health Services, Division of Drinking Water and Environmental Management, is developing a Drinking Water Source Assessment and Protection Program. DHS and the State Water Resources Control Board have formed a task force to coordinate these activities. DHS has the lead for both program development and implementation.

The final draft program must be submitted to EPA by February 1999; EPA has nine months to review and approve the program. The assessments must be completed by April 2003. DHS has responsibility under the law for ensuring that all source assessments are completed on schedule. DHS hopes that many utilities will choose to conduct their own assessments, but will conduct assessments as necessary to ensure that all are completed. DHS will encourage source water protection efforts and provide guidance to support local protection programs.

DHS has included several State agencies and various stakeholders in DWSAP development and has conducted public workshops to ensure that the most effective program possible is developed. Public workshops were conducted in April and May in Redding, Chino, Thousand Oaks, Pleasanton, and Fresno. A seminar was held at an American Water Works Association California/Nevada Section meeting in Costa Mesa.

The protection area for surface water sources is the area within the boundaries of the watershed tributary to the surface water source. A watershed sanitary survey guidance manual was prepared by the California/Nevada Section of AWWA in conjunction with DHS. This guidance specifies that the area to be surveyed should include the entire watershed.

In addition to the overall protection area, a public water system may wish to establish control zones closer to the surface water source, where activities have a higher risk of contaminating the surface water supply. Within the control zones a more thorough evaluation of potential contaminants would be conducted. The EPA

DHS procedures for conducting source water assessments are to:

- Locate the drinking water source
- Delineate source water protection areas for both surface water and groundwater
- Identify all potential contaminating activities
- Determine vulnerability of the source to contamination
- Evaluate potential new sources

publication, *State Methods for Delineating Source Water Protection Areas for Surface Water Supplied Sources of Drinking Water,* is a useful reference. Factors to be considered in establishing control zones include topography, soil, geology, vegetation, precipitation, hydrology, and land use. Methods for establishing control zones include establishing a zone using a "fixed distance," calculating the "time-of-travel" in a stream reach, and surface runoff and groundwater discharge models.

The protection area for groundwater sources includes the recharge area plus a control zone established for each well. The 1986 amendments to the Safe Drinking Water Act define groundwater protection zones or wellhead protection areas as "the surface and subsurface area surrounding a water well or well field, supplying a public water system, through which contaminants are reasonably likely to move toward and reach such water well or well field."

There are several methods for defining control zones for groundwater sources. The primary criterion is the time of travel from a point in an aquifer to a pumping well. Various contaminants which may travel faster or slower than groundwater must be considered when computing time of travel. Other factors are depth to water, recharge, aquifer material, soil, topography, vadose zone characteristics, and hydraulic conductivity of the aquifer.

There are five delineation methods for delineating control zones around public water supply wells in California. In order of increasing data requirements for successful implementation, they are: arbitrary fixed radius, calculated fixed radius, analytical methods, hydrogeologic mapping, and numerical flow and transport models.

Current information related to DWSAP, as well as the most current program draft, is available on the DHS website at: (**http:/www.dhs.cahwnet.gov**). Go to "Prevention Services," then "Division of Drinking Water and Environmental Management," then "Publications."

For more information, contact Alexis M. Milea at (510) 540-2177 or Leah Walker at (707) 576-2295. To receive hard copies of the most recent program draft, contact Joyce Silva at (916) 323-6111.

San Joaquin Valley Salt Balance

Jack Erickson is a Supervising Engineer with the Department's San Joaquin District. Manucher Alemi is a Senior Land and Water Use Analyst with the Division of Planning and Local Assistance.

The salt balance—actually the imbalance—between salt loads entering and leaving the San Joaquin Valley has been recognized for decades. The long-term accumulation of salts in the Valley, and especially on the Valley's west side, has implications for water and land management actions in the region. This article describes the salt imbalance.

In an average year, surface water supplies carry more than 800,000 tons of salt into the San Joaquin Valley's northern portion, and another 2 million tons into its southern portion. About 350,000 - 600,000 tons of salt leave the northern Valley each year, all by the San Joaquin River. Virtually no salt leaves the southern Valley. All told, the added volume of salt entering the Valley each year is enough to cover 8 football fields to a height of 100 feet.

About 65 percent of the salt entering the Valley comes from water imported from the Sacramento-San Joaquin Delta. The rest comes from weathering and dissolution of watershed soil and bedrock and their transport by runoff to the valley floor. Most water imported from the Delta is delivered to land on the Valley's west side, where drainage problems are common and natural salt concentrations are typically high. The continuing accumulation of imported salts is the crux of the Valley's salt balance problem.

Fertilizers, pesticides, and soil amendments additionally add thousands of tons of salt to Valley land and water each year. Some of these chemicals remain in the Valley; others leave as gasses or are absorbed by plants that are harvested. A sizable amount also ends up in drainage water. Although these chemicals contribute to the Valley's salt balance problem, data on their magnitude are limited.

Achieving a salt balance would require removing another 2.45 million tons of salt a year. Put a different way, in addition to current salt exports from the San Joaquin River system, 11 large semitrailers, each loaded with 25 tons of salt, would have to depart each hour, each and every day, to strike this balance.

Compounding this problem, many soils on the Valley's west side have naturally high salt concentrations. To maintain agricultural productivity, salt must be flushed from the root zones of crops to establish a soil salinity level that crops can tolerate while producing economic yields. In other words, irrigation applications must be managed to maintain a healthy salt balance in the soil. When Valley crops are irrigated, more than 70 percent of the water applied is used by the crops or evaporated from the surface of the soil. Salt in the water is left behind in the soil. If enough salt accumulates, the soil becomes too saline to grow most crops.

Good drainage is essential for maintaining the agricultural productivity of Valley soils subject to salinization. The area of greatest concern is on the Valley's west side, where the soils irrigated with imported water are derived from weathering of Coast Range formations—many of them marine in origin. A shallow and water-tight layer of clay underlies thousands of acres of farmland on the Valley's west side. Applied water meant to flush crop root zones collects on top of the clay, and groundwater levels rise with irrigation. This saline groundwater can saturate crop root zones and drown crops that have survived salt buildup.

Shallow, saline groundwater underlies nearly 500,000 acres of irrigated Valley farmland. Ultimately, more than 1 million acres may be similarly affected. Originally, the United States Bureau of Reclamation's San Luis Drain was to be used to transport drain water from the Valley to the Suisun Bay. The segment of the drain initially constructed by USBR was closed in 1986 as a result of the discovery of selenium problems at Kesterson Reservoir. This has made it essential for agricultural districts to manage irrigation applications as efficiently as possible until a regional solution for drainage management and disposal is developed.

At the farm level, growers are reducing water use by irrigating more efficiently, a practice that decreases the volume of water and salt imported into the Valley. Additionally, some growers have switched to crops that can be irrigated with a blend of fresh water and salty drainage water, a practice that does not reduce salt buildup but maintains productivity by keeping saline groundwater out of crop root zones. In the Tulare Lake Basin, some growers are collecting water from farm drains and holding it in evaporation ponds to concentrate its salts. Some districts release drainage water into the San Joaquin River on a schedule that does not compromise water quality standards now in place.

State and federal agencies have executed a memorandum of understanding to carry out drainage management recommendations made in a 1990 report prepared by the interagency San Joaquin Valley Drainage Program. The major subjects covered by the recommendations were source control, drainage reuse, evaporation ponds, land retirement, groundwater management, limits on discharge to the San Joaquin River, and institutional change. Currently the recommendations in the 1990 report are being reviewed and updated in light of new information from recent research and demonstration projects.

Earthquake Engineering Data

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The Department's recorded strong motion data include accelerations from several recent large events. In the 1989 magnitude 7.1 Loma Prieta earthquake, San Luis Dam (about 45 miles from the epicenter) recorded .25g on the dam crest and .31g on the inlet works trashracks. The 1992 magnitude 7.4 Landers earthquake triggered all the Department accelerographs in Southern California. The closest site, Cedar Springs Dam, was 55 miles from the epicenter. Accelerations of .13g were experienced on the dam crest, while .21g was recorded at the intake structure. The 1994 magnitude 6.7 Northridge earthquake produced accelerations of .35g on the crest of Castaic Dam and .76g at the reservoir outlet tower. Castaic Dam was only 24 miles from the epicenter.

Lower Colorado River Multi-Species Conservation Program

Information for this article was contributed by Colorado River Board staff.

This article reviews the status of the Lower Colorado River Multi-Species Conservation Program, an ambitious effort to administer Endangered Species Act requirements in a multijurisdiction, multispecies setting. The American portion of the Lower Colorado River Basin includes three states—Arizona, Nevada, and California—and several terrestrial and aquatic species listings under the federal ESA. Lead federal agencies are the U.S. Bureau of Reclamation and the U.S. Fish and Wildlife Service, both under the Department of the Interior. USBR operates the major river system reservoirs, such as Lake Mead in the Lower Basin.

The ESA listing and subsequent designation of critical habitat for four fish species found in the River's mainstem—the Colorado squawfish, razorback sucker, humpback chub, and bonytail chub— was the impetus for establishing the LCRMSCP. The LCRMSCP Steering Committee executed an agreement with DOI in 1995 to undertake a cooperative effort to develop a multispecies conservation program for ESA-listed species and many nonlisted, but sensitive, species within the 100-year floodplain of the lower Colorado River, from Glen Canyon Dam downstream to the Mexican border.

The Steering Committee is composed of representatives from California, Nevada, and Arizona, organized under a joint participation agreement. USFWS has designated the Steering Committee as an ecosystem conservation and recovery implementation team pursuant to ESA.

The conservation program will work toward recovery of listed and sensitive species while providing for current and future use of Colorado River water and power resources, and includes USBR's Colorado River operation and maintenance actions for the lower River. Over 100 species will be considered in the program, including the southwestern willow flycatcher, Yuma clapper rail, and the four listed fish species mentioned above. Developing the program will take approximately three years, with the estimated $4.5 million cost to be equally split between DOI and nonfederal interests.

A cost-sharing agreement for the program was executed in 1996. USBR has initiated a formal Section 7 consultation with USFWS, and a five-year final biological opinion on USBR operation and maintenance activities from Lake Mead to the southern international boundary with Mexico was issued in 1997. USBR has estimated that the cost of implementing the biological opinion's reasonable and prudent alternatives and measures could be as high as $26 million.

The Steering Committee is currently participating in funding several interim conservation measures. These include a razorback sucker recovery program at Lake Mojave, restoration of Deer Island near Parker, Arizona, and a "Bring Back the Natives" program sponsored by the National Fish and Wildlife Foundation.

Chino Basin Multipurpose Project

Information for this article was contributed by the Chino Basin Water Conservation District staff

The Chino Basin Water Conservation District, created to manage the basin's groundwater resources, is within the drainage basin of Santa Ana River in southwestern San Bernardino County. The CBWCD is working with other local agencies to promote construction of multipurpose projects that would provide flood control and groundwater recharge benefits, and has completed a scoping report for a small project that could provide an average annual additional groundwater recharge of about 1,200 acre-feet for the basin. Currently, the State is in the process of providing financial assistance to the San Bernardino County Flood Control District for interim flood control measures to help manage stormwater runoff.

The project would entail construction of a flood control conduit and two detention basins in and southerly of the City of Ontario, in an area commonly referred to as the "Agricultural Preserve." Currently, the San Bernardino County Flood Control District plans to build flood control facilities to handle stormwater runoff from major arterial streets. Vineyard Avenue, for example, is a major arterial that provides access to Ontario International Airport. This winter, Vineyard Avenue was once again under water as El Nino visited San Bernardino County.

Stormwater from these arterial streets discharges into the Santa Ana River, eventually reaching Prado Dam. The normally higher-quality urban stormwater picks up elevated levels of dissolved solids and total nitrogen as it spreads beyond the arterial streets and into lands within the Agricultural Preserve. Although Prado is a flood control detention dam, it maintains a small permanent pool. At times, stormwater pollutant levels are high enough to kill fish.

CBWCD's preliminary estimate of the cost of the water developed by the proposed facilities is $236/acre-foot—much less expensive than new supplies of imported water. Stormwater management projects like this one offer important benefits to the region. As Clean Water Act requirements for control of nonpoint source pollution (specifically stormwater), become more stringent, stormwater detention and primary sedimentation basins will increasingly be needed. The potential for increased groundwater recharge is valuable in this urbanizing area. In 1978 when the court adopted a judgement adjudicating Chino Basin groundwater, about 30 percent of the basin's safe yield was estimated to come from irrigation return flows. Irrigated agriculture is projected to disappear from the basin by 2020. Without construction of more multi-purpose detention basins, the system of concrete lined flood control channels built to carry urban stormwater to the Santa Ana River would eliminate recharge that formerly occurred in the basin's stream channels and floodplains.

Alfalfa and Market Conditions

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easily as they do tomatoes, almonds, or vineyards. However, alfalfa's support of California's dairy industry has provided processors with milk for the manufacturing of ice cream, cheese, butter, and many other products.

A substantial amount of water is used to produce alfalfa, an estimated 20 to 27 percent of the State's total agricultural applied water. However, this does not mean that alfalfa is inefficient in its use of water. In recent years, alfalfa's irrigated acreage has fluctuated at a level of some one million acres. Its total water use is thus greater than that of crops with lower acreage. Alfalfa grows and is irrigated throughout the warm season, allowing growers to make as many as 8 cuttings per year in the San Joaquin Valley and 11 cuttings per year in the Imperial Valley. It is a very high-yielding crop; the entire aboveground plant is harvested and used, unlike most field and horticultural crops.

An important characteristic of alfalfa production, in addition to its economic value, is its role in maintaining soil health, preventing soil erosion, and boosting the yields of subsequent crops. The nitrogen fixing ability of alfalfa provides nitorgen for subsequent crops and its extensive root system improves soil water holding capacity. Alfalfa also takes up leached nitrogen applied to previous crops, increases organic matter, and provides soil erosion protection.

Water Use Implications of Land Use Planning

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the result of expected urbanization of agricultural lands, especially in the San Joaquin Valley and South Coast areas. Local open space preservation goals can affect the extent of land use conversion. Williamson Act contracts, for example, are a frequently used means of encouraging preservation of agricultural land use, especially for agricultural lands near urban areas. (There is a bill pending in this session of the Legislature that would extend the term of Williamson Act contracts from their present 10 years to 20 years to encourage long-term preservation of agricultural land use.) Open space preservation goals do not necessarily affect water use, however. Some land use planning agencies in the eastern Bay Area have set aside ridgetop areas as lands to be managed for recreation or open space to preserve viewsheds. Because the areas set aside were largely nonirrigated grazing lands, water use impacts were minimal.

At a local level, the extent and location of new development are dictated by city and county land use planning decisions. A statute enacted in 1995 required that cities and counties making specified land use decisions, such as general plan amendments, consult with local water agencies to determine if water supply is available. The statute also required that local water agencies' findings on water supply availability be incorporated into city or county environmental documentation for proposed actions. At this time, there are no hard data on the extent to which this requirement has affected land use planning decisions.

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Statewide Statistics

A water source's total dissolved solids concentration (salt content) influences how that water source may be used and what forms of aquatic life it may support. The TDS concentration of California water bodies ranges from saltier than seawater to drinking water quality.

Water source	Representative weight of solids in 1 acre-foot of water
Mono Lake	110 tons
Salton Sea	60 tons
Seawater	48 tons
Brackish groundwater (3,000 mg/l TDS)	4 tons
Colorado River @ Parker Dam	1 ton
California Aqueduct @ Banks Pumping Plant	500 pounds

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